

Saddle collapse behind rapid sea level rise

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Researchers from the University of Bristol in the United Kingdom have uncovered the mystery behind the rapid sea level rise in the past by using climate and ice sheet models. Funded in part by a Marie Curie Action grant under the EU's Seventh Framework Programme (FP7), the results showed that the process, called 'saddle collapse', generated two rapid sea

level rise events: the Meltwater pulse 1a (MWP1a), some 14,600 years ago, and the '8,200 year' events. The results were published in the journal *Nature*.

While researchers have tried to discover what triggered these events, no concrete information was ever found, until now. Dr Lauren Gregoire from the School of Geographical Sciences at the University of Bristol and colleagues observed how the events triggered the collapse and separation of ice domes over North America, thus resulting in rapid melting and the opening of an ice-free corridor.

Ice domes that were up to three kilometres thick were formed in areas of high [snowfall](#) and higher [topography](#) like the [Rocky Mountains](#). The ice sheet consisted of the saddles, which were lower valleys of ice between the domes.

Researchers say the climate warmed naturally towards the end of the [last ice age](#). In this study, the scientists found that the ice melted at increasingly high elevations, and later reached and melted the saddle area between the ice domes. They observed that the melting saddle shrank, reaching warmer altitudes and melting more quickly. The end result was a completely melted saddle. Within 500 years, the saddles were gone and only the ice domes remained.

The researchers said the melted ice flowed into the oceans, generating rapid sea level rises of 9 metres in 500 years during the Meltwater pulse 1a event 14,600 years ago and 2.5 metres in the second event, 8,200 years ago.

'We didn't expect our model to produce such a rapid [sea level rise](#),' said lead author Dr Gregoire. 'We got really excited when we realised that the events we simulated corresponded to real events! The [meltwater](#) pulse produced by the saddle-collapse can explain more than half of the sea

level jump observed around 14,600 years ago. The rest probably came from the progressive melting of ice sheets in Europe and Antarctica.'

According to the researchers, the results identify the process that triggered the melting of the North American ice sheet and resulted in the rapid sea level rises in the past. However, they also provide insight into the nature of ice sheets and climate change.

They add that this study can lead to more testing of climate and ice sheet models. These types of models could reflect patterns observed in natural records, and in turn increase people's confidence in them.

More information: Gregoire, L.J., et al. 'Deglacial rapid sea level rises caused by ice-sheet saddle collapses', *Nature*, 2012, 487.

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